

Carotid Intima Media Thickness in the Astronaut Corps: Association to Spaceflight

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Background

Carotid Intima Media Thickness (CIMT) has been demonstrated to be predictive of future cardiovascular events. Within various populations, radiation exposure, stress, and physical confinement have all been linked to an increased CIMT. Recent research discovered CIMT was significantly increased in ten long duration astronauts from pre-flight to four days post flight. The relationship between spaceflight and CIMT is not understood and trends in CIMT within the larger astronaut population are unknown.

Methods

In 2010, CIMT was offered as part of the astronaut annual exam at the JSC Flight Medicine Clinic using a standardized CIMT screening protocol and professional sonographers. Between 2010 and 2016, CIMT measurements were collected on 213 NASA astronauts and payload specialists. The values used in this retrospective chart review are the mean of the CIMT from the right and left. Spaceflight exposure was categorized based on the total number of days spent in space at the time of the ground-based ultrasound (0, 1-29, 30-100, 101-200, ≥ 200). Linear regression with generalized estimating equations were used to estimate the association between spaceflight exposures and CIMT.

Results

530 studies were completed among 213 astronauts with a mean of 2.5 studies (range 1-6) per astronaut over the six year period. As in other populations, CIMT was significantly associated with age; however, gender was not. While there was no significant direct correlation between total spaceflight exposure and CIMT found, astronauts with 30-100 spaceflight days and astronauts with greater than 100 spaceflight days had significantly increased CIMT over astronauts who had never flown ($p=0.002$ and $p<0.0001$ respectively) after adjustment for age.

Conclusion

Further work is needed to fully understand CIMT and its association to spaceflight. Current occupational surveillance activities are under way to study CIMT values in conjunction with other cardiovascular risk factors among astronauts as compared to the general population.